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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT APPLICATION EXAMINING OPERATIONS

Appl. No.	: 09/882,416	Confirmation No. 8410
Applicant	: Petrus Van Beek et al.	
Filed	: June 15, 2001	
TC/A.U.	: 2167	
Examiner	: Khanh B. Pham	
Docket No.	: KLR 7146.100	
Customer No.	: 00152	
Title	: METADATA IN JPEG 2000 FILE FORMAT	

DECLARATION UNDER 37 CFR § 132

I, Ibrahim Sezan, hereby declare as follows:

1. My residence address is 2213 NW Hood Drive, Camas, Washington 98607.

2. I, together with Petrus Van Beek and George Borden IV, am a co-inventor of the present U.S. Patent Application Serial No. 09/882,416, which claims the benefit of the filing date of provisional application Serial No. 60/214,878 filed on June 28, 2000. I am also one of the joint inventors of U.S. Patent No. 6,070,167, which was cited by the Examiner as prior art in a rejection under 35 U.S.C. § 103(a). That patent issued on, and has an effective date of, May 30, 2000.

3. Based upon my knowledge, and co-inventorship, of the subject matter of the present U.S. Patent Application Serial No. 09/882,416, the subject matter disclosed in, and claimed by, the present application was reduced to practice on a date prior to May 30, 2000, the effective date of Qian et al., U.S. Patent No. 6,070,167. Attached to this declaration is a redacted version of an invention disclosure statement that describes the subject matter claimed by the present application. That invention disclosure statement details the conception date of the invention(s) claimed by the present application, along with the dates at which the invention was described in writing, and fully disclosed to a patent attorney involved in preparing the present

application. All of those dates are prior to May 30, 2000, the effective date of Qian et al., U.S. Patent No. 6,070,167

4. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United State Code and that such willful, false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated April 20, 2006

Ibrahim Sezan

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: 4/21/06

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SLA Docket No: SLA 0329

1. **Descriptive Title of Invention:** **Method for Metadata Embedding to JPEG2000 Files Using Extensible Markup Language**

2. **Inventor(s):**

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Supervisor's Acknowledgment: **"I believe this disclosure is novel and complete and should be submitted to the Patent Review Committee."**

Supervisor's Signature: _____

Date: _____

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3. Project & Supervisor:

Supervisor's Name: Jeff Sampsell

Supervisor's Title: Vice President

Project Number/Name: JPEG2000 and MPEG-7

4. Conception of the Invention:

Date Conceived: [redacted]

Date of first Written Description: [redacted]

Notebook & Page No. or File Archive: N/A

Date first explained to others (whom?): [redacted] (Kevin Russell)

Planned Application for the Invention: Information Enhanced Imaging

5. Construction & Test of First Prototype Embodying the Invention:

Date First Prototype Completed: N/A

Part Number/Product Description: N/A

Date of First Successful Test: N/A

Successful Operation Witnessed By: N/A

6. Public Disclosure of Invention (Presentation at public meeting or publication) (NOTE: Patent Application MUST be filed prior to any public disclosure.):

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Date of First Public Disclosure: [redacted]

Setting (Conference/Journal Name): JPEG2000 Email Reflector

Title of Paper or Presentation: N/A

Type of Disclosure (Written/Verbal): Email

Does Data Sheet or Application Note Disclose the Invention (when)? N/A

7. What is the field of the invention (Invention relates to...):

The invention relates to metadata embedding to a JPEG2000 file by taking advantage of the file format specification in Part 1 of the JPEG2000 standard, and by making use of the MPEG-7 standard so that the syntax and semantics of the embedded metadata is compliant with an international standard and thus such information can be exchanged and consumed by a wide range of different applications.

8. What is the problem solved by your invention? How is it solved in the prior art (do not put search pages here)?

The JPEG2000 committee has recently completed a Final Committee Draft (FCD) of their Part 1 standardization. The JPEG2000 FCD includes a file format specification (JP2 file format) where the file format encapsulates the coded image bitstream as well as metadata. Metadata may be contained in "boxes" that store information expressed in Extendable Markup Language (XML) (the so-called "XML

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boxes"), and boxes that store binary data where the data boxes (the so-called "UUID boxes" where UUID stands for Universal Unique Identifier) can be uniquely identified. The UUID boxes allow vendors to store data in the file without conflicting with other vendors.

Through the use of the XML and UUID boxes, The JPEG2000 file format allows the storage of metadata about the image within the same file containing the coded image data itself. (Complete specification of the JPEG2000 file format including the definition of all boxes can be found in [1] "ISO/IEC JTC 1/SC 29/WG1 N1646, JPEG 2000 Part I Final Committee Draft Version 1.0, March 2000.)

The JPEG2000 specification does not however define the syntax and semantics for the metadata that can be placed in the XML and/or UUID boxes in the JP2 file. There is therefore a need for specification of syntax and semantics for the contents of these boxes, preferably a standardized syntax and semantics specification that will permit the exchangeability of the metadata contents contained in these boxes. The current invention provides syntax and semantics specification for metadata that may populate the XML and UUID boxes.

In parallel to the JPEG2000 standardization activity, MPEG-7 is working towards standardization of media content descriptions -- a structured set of descriptors and metadata expressed in XML. It is therefore possible to include the compressed image data and the descriptions about the image content into a single file – a JPEG2000 file – using the JPEG2000 file format specification, particularly the XML box structure.

Here, we focus on particular types of metadata for a particular class of applications. We consider the problem of defining and identifying multiple hot spots (e.g., bounding boxes) in the image and associating metadata and information with these hot spots, where metadata are typically related to the objects (or image regions) that are highlighted by the hot spots. We show how the XML box, or the XML and the UUID boxes, in the JPEG2000 file format can be utilized to store descriptions and data that define and identify the hot spot regions as well as data associated with these regions, such as object specific URL links, voice annotation, and textual annotation. One of many applications of such data is user interaction with images where users interactively discover and consume information that relate to the contents of the image.

Although our focus here is MPEG-7 compliant XML documents (i.e., XML documents that are valid according to MPEG-7 description schemes which are expressed in terms of the XML Schema), the XML box in a JPEG2000 file may contain XML documents that are not necessarily MPEG-7 compliant. The schema of the document and the semantics may vary from application to application. The validating XML Schema may be stored in the JPEG2000 file, for example in the UUID box. In that case, a JP2 file becomes self-contained.

In US 6070167, we have disclosed a 2-level hierarchical data structure for object-based information embedding to images, with particular focus on defining hot spots and embedding various types of data. In SLA 107, we have disclosed a proprietary file format specification, called JFIF+, for embedding object based information to JPEG images.

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9. How is your solution different from the prior art (one paragraph or list)?

In this invention, we consider the JPEG2000 file format specification. We take advantage of the fact that JPEG2000 file format allows for an XML box structure for metadata embedding. We propose to populate the XML boxes with MPEG-7 descriptions of the image content, which are expressed in XML. This solution is advantageous with respect to that proposed in SLA107 [8] because it is based on an international standard.

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In particular we focus on describing and identifying multiple image regions and associating metadata with these regions by making use of the XML box mechanism defined by JPEG2000.

To the best of our knowledge bringing the two international standards (MPEG-7 and JPEG2000) together in this type of application is novel.

10. **Please give a detailed description of your invention, include any graphics, notebook pages or other material necessary to understand your invention.**

Introduction

In the following, the discussions are based on Description Schemes that are expressed in MPEG-7 Description Definition Language (DDL) [4], which is based on the XML Schema Language (XSL). Note that Descriptions Schemes specify the syntax and semantics of the corresponding descriptions, which are expressed in XML. Descriptions are generated according to the corresponding description schemes; in other words, they have to be valid according to the description schemes.

Definition and Identification of Multiple Hot Spots in an XML Box

Definition and identification of multiple hot spots in the image is achieved using the Still Region Description Scheme [2][3]. The Still Region Description Scheme (DS) is derived from the Segment Description Scheme. The Segment Description Scheme is used to specify the structure of spatial and temporal segments of visual data such as images and video in general. Segments can be decomposed into other segments. The Still Region Description Scheme is used to specify a spatial type of segment in still images or single video frames.
The Segment Description Scheme (DS) and the Still Region DS, as expressed in XSL, are as specified follows (parts of the syntax and semantics specification that are particularly relevant to hot spots are highlighted by gray; In some cases, notes are added to the semantic definitions in order to clarify the usage in this particular application; In other cases, semantics of some of the elements are skipped for the sake of simplicity):

```
<!-- ################################################ -->
<!-- Definition of "Segment DS"                       -->
<!-- ################################################ -->

<!-- Definition of datatype of the decomposition      -->
<simpleType name="DecompositionDataType" base="string">
      <enumeration value="spatial"/>
      <enumeration value="temporal"/>
      <enumeration value="spatio-temporal"/>
      <enumeration value="MediaSource"/>
</simpleType>

<!-- Definition of the decomposition
<complexType name="SegmentDecomposition">
      <element ref="Segment" minOccurs="1" maxOccurs="unbounded"/>
      <attribute name="DecompositionType"
```

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```
type="mds:DecompositionDataType" use="required"/>
            <attribute name="Overlap" type="boolean" use="default"
                  value="false"/>
            <attribute name="Gap" type="boolean" use="default"
                  value="false"/>
      </complexType>
      <element name="Segment" type="mds:Segment"/>

      <!-- Definition of the Segment itself   -->
      <complexType name="Segment" abstract="true">
            <element name="MediaInformation" type="mds:MediaInformation"
                  minOccurs="0" maxOccurs="1"/>
            <element                                    name="CreationMetaInformation"
type="mds:CreationMetaInformation"
                  minOccurs="0" maxOccurs="1"/>
            <element                                    name="UsageMetaInformation"
type="mds:UsageMetaInformation"
                  minOccurs="0" maxOccurs="1"/>
            <element                                    name="StructuredAnnotation"
type="mds:StructuredAnnotation"
                  minOccurs="0" maxOccurs="unbounded"/>
            <element name="MatchingHint" type="mds:MatchingHint"
                  minOccurs="0" maxOccurs="unbounded"/>
            <element name="PointOfView" type="mds:PointOfView"
                  minOccurs="0" maxOccurs="unbounded"/>
            <element                                    name="SegmentDecomposition"
type="mds:SegmentDecomposition"
                  minOccurs="0" maxOccurs="unbounded"/>
            <attribute name="id" type="ID" use="required"/>
            <attribute name="href" type="uriReference" use="optional"/>
            <attribute     name="idref"     type="IDREF"     refType="Segment"
use="optional"/>
      </complexType>
```

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Semantic of the SegmentDecomposition DS:

Name	*Definition*
SegmentDecomposition	Decomposition of a segment into one ore more segments.
DecompositionDataType	Datatype defining the kind of segment decomposition. The possible kinds of segment decomposition are spatial, temporal, spatio-temporal, and media source. (Note: Hot spots in an image are Spatial segments.)
DecompositionType	Attribute, which specifies the decomposition type of a segment.
Overlap	Boolean, which specifies if the segments resulting from a segment decomposition overlap in time or space. This attribute is optional. (Note: Hot spots in an image may overlap).
Gap	Boolean, which specifies if the segments resulting from a segment decomposition leave gaps in time or space. This attribute is optional.
Segment	Set of (Sub-)segments that form the decomposition

Semantic of the Segment DS:

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Name	*Definition*
Segment	Abstract structure, which represents a fragment or section of the AV content. For example, a segment could be a region in an image or a moving region in a video sequence. A segment can be decomposed into other segments through the SegmentDecomposition DS. (Note: This can be used to precisely specify the object's shape, if needed, within a bounding box, where the outline of the object is specified in terms of a decomposition of the bounding box.)
id	Identifier of a video segment (Note: This is used to uniquely identify multiple hot spots – spatial segments -- in an image).
DecompositionDataType	Datatype defining the kind of segment decomposition. The possible kinds of segment decomposition are spatial, temporal, spatio-temporal, and media source.
MediaInformation	Media information related to the segment and is descendants
CreationMetaInformation	Creation Meta information related to the segment and its descendants (Note: This may be used to associate data with segments, such as URL, audio files, etc. – as will be discussed below.)
UsageMetaInformation	Usage Meta information related to the segment and is descendants
SegmentDecomposition	Decomposition of the segment into sub-segments.
Annotation	Textual annotation and description of people, animals, objects, actions, places, time, and/or purpose which are instantiated in the segment. (Note: This may be used to associate textual annotations with the hot spots.)

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```
      <!-- ########################################### -->
      <!-- Definition of "StillRegion DS"              -->
      <!-- ########################################### -->

      <element              name="StillRegion"              type="mds:StillRegion"
equivClass="Segment"/>
      <complexType              name="StillRegion"              base="mds:Segment"
derivedBy="extension">
            <element ref="ColorSpace" minOccurs="0" maxOccurs="1"/>
            <element ref="ColorQuantization" minOccurs="0" maxOccurs="1"/>
            <element ref="DominantColor" minOccurs="0" maxOccurs="1"/>
            <element ref="ColorHistogram" minOccurs="0" maxOccurs="1"/>
            <element ref="BoundingBox" minOccurs="0" maxOccurs="1"/>
            <element ref="RegionShape" minOccurs="0" maxOccurs="1"/>
            <element ref="ContourShape" minOccurs="0" maxOccurs="1"/>
            <element        ref="ColorStructureHistogram"        minOccurs="0"
maxOccurs="1"/>
            <element ref="ColorLayout" minOccurs="0" maxOccurs="1"/>
            <element ref="CompactColor" minOccurs="0" maxOccurs="1"/>
            <element ref="HomogeneousTexture" minOccurs="0" maxOccurs="1"/>
```

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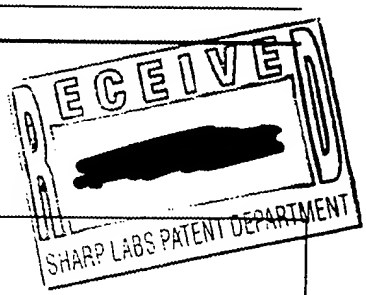
```
            <element ref="TextureBrowsing" minOccurs="0" maxOccurs="1"/>
            <element ref="EdgeHistogram" minOccurs="0" maxOccurs="1"/>
            <attribute        name="SpatialConnectivity"        type="boolean"
use="required"/>
            <!-- Restriction of refType to StillRegion DS -->
            <attribute    name="idref"    type="IDREF"    refType="StillRegion"
use="optional"/>
      </complexType>
```

Name	*Definition*
StillRegion	Set of pixels from an image or a frame in a video sequence. Note however, that no motion information can be used to describe a still region. Still images can be natural images or synthetic images. A still image is a particular case of still region. The pixels do not need to be connected (see the SpatialConnectivity attribute).
SpatialConnectivity	Boolean which specifies if a still region is connected in space, i.e. connected pixels.
ColorSpace	Description of the color space used for the color Ds and DSs of the still region (see the Visual part of the standard [5,6])
ColorQuantization	Description of the color quantization used for the color Ds and DSs of the still region (see the Visual part of the standard [5,6])
DominantColor	Description of the Dominant color of the region (see the Visual part of the standard [5,6])
ColorHistogram	Description of the color histogram of the region (see the Visual part of the standard [5,6]) (Note: This may be used to embed a low-level color description to hot spots, when necessary.)
BoundingBox	Description of a rectangular box containing the region (Note: This is used to describe the hot spot as a rectangular region – we assume that a bounding box is the most common and straightforward geometry for the hotspots.) (see the Visual part of the standard [5,6])
RegionShape	Description of the region shape (see the Visual part of the standard [5,6])
ContourShape	Description of the region shape (see the Visual part of the standard [5,6])
ColorStructureHistogram	(see the Visual part of the standard [5,6])
ColorLayout	(see the Visual part of the standard [5,6])
CompactColor	(see the Visual part of the standard [5,6])
HomogeneousTexture	(see the Visual part of the standard [5,6])
TextureBrowsing	(see the Visual part of the standard [5,6])
EdgeHistogram	(see the Visual part of the standard [5,6])

To summarize:



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a. Using the above specifications, the hot spots in a JPEG image may be described as `spatial` segments.
b. The descriptor `BoundingBox` is used to define the locations and dimensions of (multiple) hot-spot regions.

c. Each region is identified by an `id`, which is unique in the scope defined by the XML box.

Next, we will discuss the use of the CreationMetaInformation DS and the Annotation DS to attach URLs and/or textual annotations with the hot spots.

Embedding of Textual Annotation, Voice Annotation and URLs in an XML Box

In the following, we address embedding of textual annotations, voice annotations and/or URLs to hot spots that may be defined and identified using the XML descriptions generated by the Description Schemes discussed above.

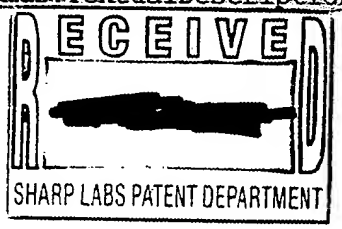
Embedding of Textual Annotation

Textual annotation for each one of the hot spots is implemented according to the `StructuredAnnotation DS` that is referenced by the Segment DS as shown in the above. Each segment can reference the Annotation DS individually and at multiplicities identified by their corresponding identifiers.

```
      <!-- ##################################################### -->
      <!-- Definition of StructuredAnnotation DS                 -->
      <!-- ##################################################### -->

      <element name="TextAnnotation" type="mds:TextualDescription"/>

      <element name="StructuredAnnotation" type="mds:StructuredAnnotation"/>
   <complexType name="StructuredAnnotation">
            <element name="Who" type="mds:ControlledTerm" minOccurs="0"/>
            <element        name="WhatObject"        type="mds:ControlledTerm"
minOccurs="0"/>
            <element        name="WhatAction"        type="mds:ControlledTerm"
minOccurs="0"/>
            <element name="Where" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="When" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="Why" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="TextAnnotation" type="mds:TextualDescription"
minOccurs="0"/>
            <attribute name="id" type="ID"/>
            <attribute ref="xml:lang"/>
      </complexType>
```



The semantics are defined as:

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Name	*Definition*
TextAnnotation	Free textual annotation.
StructuredAnnotation	Textual free annotation and description of people, animals, objects, actions, places, time, and/or purpose.
Who	Textual description of people and animals. May be from a thesaurus or a controlled vocabulary.
WhatObject	Textual description of objects. May be from a thesaurus or a controlled vocabulary.
WhatAction	Textual description of actions. May be from a thesaurus or a controlled vocabulary.
Where	Textual description of places. May be from a thesaurus or a controlled vocabulary.
When	Textual description of time. May be from a thesaurus or a controlled vocabulary.
Why	Textual description of purpose. May be from a thesaurus or a controlled vocabulary.
Annotation	Textual free annotation and description of people, animals, objects, actions, places, time, and/or purpose.
id	Identifier for an instantiation of the StructuredAnnotation DS.

Embedding of URLs

URL links for each hot-spot are realized using the RelatedMaterial description. The RelatedMaterial DS is referenced by the CreationMetaInformation DS that is defined above. Each segment (e.g., each hot spot) references CreationMetaInformation DS, multiple times if desired (see the Segment DS specification above). The RelatedMaterial DS is specified as follows:

```
<!-- ################################################ -->
<!--   Definition the RelatedMaterial DS              -->
<!-- ################################################ -->

<DSType name="RelatedMaterial">
    <attribute name="id" datatype="ID"/>
    <attribute name="Master" datatype="boolean" default="true"
                                                required="false" />
    <DTypeRef  name="MediaType"                 type="controlledTerm"/>
    <DSTypeRef type="MediaLocator"              minOccurs="0"/>
    <DSTypeRef type="MediaInformation"          minOccurs="0"/>
    <DSTypeRef type="CreationMetaInformation" minOccurs="0"/>
    <DSTypeRef type="UsageMetaInformation"    minOccurs="0"/>
</DSType>
```

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Name	*Definition*
RelatedMaterial	Description of the materials containing additional information about the AV content.

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Name	*Definition*
`Master`	Boolean attribute that allows to identify if the referenced related material is the master.
`MediaType`	The media type of the referenced related material (e.g., Web page, audiovisual media, a printed book)
`MediaLocator`	The locator of the referenced related material.
`MediaInformation`	The Media Information description of the referenced related material.
`CreationMetaInformation`	The Creation Meta Information description of the referenced related material.
`UsageMetaInformation`	The Usage Meta Information description of the referenced related material.

The `MediaType` descriptor describes the type of the media (e.g., audio, web). For a URL link, `MediaType` is "web" and the URL is specified using the `MediaLocator`.

To point to related media that is stored in the same JPEG2000 file, the Media Locator will point to the same JPEG2000 file, as will be discussed below.

Embedding of Voice Annotation

Now we address embedding of data other than textual annotation or URL links to the hot spot regions. An example of such data is audio for voice annotation. Voice annotation is realized by specifying the media type in the Related Material description as "**audio**".

We now address the specification of the MIME type/format of the audio data and the encapsulation of data itself within a JPEG2000 file. Our method given below is applicable to any binary data (e.g., an executable computer program, where MediaType may be specified as "**executable** code"), and is therefore not limited to audio and voice annotation. It makes use of the XML box mechanism in the JPEG2000 file format. The media data is stored within the XML box; we refer to this mode of media storage as "in-line media".

We first define the `InlineMedia` DS that will be utilized to specify MIME-type/Format and actual carriage of the inline media data. This is achieved by modifying the current MediaLocator specification in MPEG-7. We modify the current specification by incorporating `InlineMedia` description into the `MediaLocator`, as we show below.

The following datatype defines a base-16 binary string, e.g. "98A34F10C5", where each byte is encoded using two ASCII characters. This is like 'uuencoding' the binary data. Note that storage size is multiplied by 2 and conversion between the actual binary stream and its XML encoding is necessary before decoding/playback. An alternative base-64 encoding is also allowed in XML Schema Language, leading to a storage expansion factor of 1.5 instead of 2.

```
<simpleType name="hexBinary" base="binary">
      <encoding value="hex"/>
</simpleType>
```

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InlineMedia is then defined as follows, where the format of the media stream is indicated by a choice of either a `MediaFormat DS` or a FileFormat (MIME-type) identifier, as shown below:

```
<complexType name="InlineMedia">
      <choice>
            <element name="MediaFormat" type="mds:MediaFormat"/>
            <element name="FileFormat" type="mds:ControlledTerm"/>
      </choice>
      <element name="MediaData" type="hexBinary"/>
</complexType>
```

InlineMedia description contains the data itself.

The MediaFormat DS is specified in MPEG-7 as follows:

```
      <!-- ################################################ -->
      <!--   Definition the MediaFormat DS                  -->
      <!-- ################################################ -->

      <complexType name="MediaFormat">
            <element name="FileFormat" type="mds:ControlledTerm"/>
            <element name="System" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="Medium" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="Color" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="Sound" type="mds:ControlledTerm" minOccurs="0"/>
            <element name="FileSize" type="nonNegativeInteger" minOccurs="0"/>
            <element name="Length" type="mds:TimePoint" minOccurs="0"/>
            <element      name="AudioChannels"      type="nonNegativeInteger"
minOccurs="0"/>
            <element name="AudioLanguage" type="language" minOccurs="0"/>
            <attribute name="id" type="ID"/>
      </complexType>
```

Name	*Definition*
`MediaFormat`	Description of the storage format of the media
`id`	Identification of the instance of the media format description
`FileFormat`	The file format or MIME-type of the AV content instance.
`System`	The video system of the AV content (e.g., PAL, NTSC).
`Medium`	The medium on which the AV content is stored (e.g., tape, CD, DVD).
`Color`	The color domain of the AV content (e.g., color, b/w, colored).
`Sound`	The sound domain of the AV content (e.g., no sound, stereo, mono, dual).
`FileSize`	The size, in bytes, of the file where the AV content is stored.
`Length`	The duration of the AV content.
`AudioChannels`	The number of audio channels in the AV content.
`AudioLanguage`	The language used in the audio of the AV content.

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Finally, the existing MediaLocator in MPEG-7 (Documents N3410 and N3411, May 2000) is extended by adding the `InlineMedia DS` as follows.

```
<complexType name="MediaLocator">
      <choice>
            <sequence>
                  <element name="MediaURL" type="mds:MediaURL"/>
                  <element name="MediaTime" type="mds:MediaTime"
minOccurs="0"/>
            </sequence>
            <element name="MediaTime" type="mds:MediaTime"/>
            <element name="InlineMedia" type="mds:InlineMedia"/>
      </choice>
</complexType>
```

An example instantiation of the `MediaLocator DS` becomes:

```
<MediaLocator>
      <InlineMedia>
            <FileFormat>mp3</FileFormat>
            <MediaData>98A34F10C5094538AB9387362522DA3</MediaData>
      </InlineMedia>
<MediaLocator>
```

In summary, this method will require the instantiation of `MediaType` and `MediaLocator DS` (as defined above) in the `RelatedMaterial DS`.

An alternative Implementation:

An alternative implementation assumes that the media data can be placed at any arbitrary location in the JPEG2000 file. In this case, the MediaLocator is alternatively modified as follows:

```
<complexType name="MediaLocator">
      <choice>
            <sequence>
                  <element name="MediaURL" type="mds:MediaURL"/>
                  <element name="MediaTime" type="mds:MediaTime"
minOccurs="0"/>
            </sequence>
            <sequence>
                  <element name="MediaURL" type="mds:MediaURL"/>
                  <element name="ByteOffset" type="nonNegativeInteger"
minOccurs="0"/>
            </sequence>
            <element name="MediaTime" type="mds:MediaTime"/>
      </choice>
</complexType>
```

In this case, the `MediaURL` points to the JPEG2000 file itself. The format of the media is specified by the `MediaFormat DS`.

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11. What other embodiments or examples are there of your invention?

In another embodiment, the media data is included in a UUID box in the JPEG2000 file. In this embodiment MPEG-7 description schemes are used in their current forms.

The main issue here is the specification of the UUID of the UUID box, and hence linking the XML Box to the UUID Box. According to the JPEG2000 FCD, the UUID specifies/identifies the vendor specific format of the contents of the UUID Box. URL referencing extensive information about this format can be included in the JPEG2000 file using the UUID Info Box mechanism [1].

In this embodiment, the UUID box is implicitly referenced from the XML box via the `MediaFormat DS`. Regarding the format of the audio file for voice annotation, it is pre-specified (e.g., published) by the vendor as a part of vendor's format specification for its UUID box.

```
<!-- ################################################ -->
<!--   Definition the MediaProfile DS                 -->
<!-- ################################################ -->

<DSType name="MediaProfile">
    <attribute name="id" datatype="ID"/>
    <DSTypeRef type="MediaIdentification"/>
    <DSTypeRef type="MediaFormat"/>
    <DSTypeRef type="MediaCoding"    minOccurs="0" maxOccurs="*"/>
    <DSTypeRef type="MediaInstance" minOccurs="0" maxOccurs="*"/>
</DSType>
```

Name	*Definition*
`MediaProfile`	DS describing one profile of the media being described.
`id`	Identification of the instance of the MediaProfile description.
`MediaIdentification`	Identification of the master media profile.
`MediaFormat`	Description of the storage format of the master media profile
`MediaCoding`	Description of the coding parameters of the master media profile
`MediaInstance`	Identification and the localization of the master media profile

```
<!-- ################################################ -->
<!--   Definition the MediaInformation DS             -->
<!-- ################################################ -->

<DSType name="MediaInformation">
    <attribute name="id" datatype="ID"/>
    <DSTypeRef type="MediaProfile" maxOccurs="*" />
</DSType>
```

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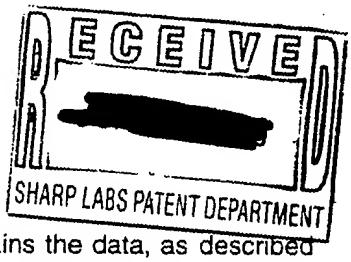
Name	*Definition*
`MediaInformation`	The MediaInformation DS contains one or more MediaProfile DSs. Each MediaInformation DS is related to one reality. For example, a concert may have been recorded in audio and in audio-visual media. Afterwards each media may be available in different format, e.g. the audio media in CD, and the audio-visual media in MPEG-1, MPEG-2, and MPEG-4. This will imply four MediaProfiles for the same reality.
`id`	Identification of the instance of the MediaProfile description.
`MediaProfile`	DS describing one profile of the essence being described.

In this alternative embodiment, when the `Media Locator` within the Related Media description points at the JPEG2000 file itself via MediaURL, the client application implicitly knows that the related media is contained in a UUID box within this same file containing the XML box. The UUID is referenced through Media Format description.

The application will then locate the UUID box with the matching ID in the file and read its contents. The format of the audio media (e.g., mp3) that is contained in the UUID box may be specified a priori by the owner of the UUID format. (Or it can be published and referenced using the mechanism of the UUID Info Box in the JPEG2000 file format.)

The mechanism for referring to the JPEG2000 file itself and the UUID from the XML box is summarized below, using the current MPEG-7 description schemes and their hierarchical structure:

. . . .
RelatedMaterial
MediaType
Audio
MediaLocator
URL: JPEG2000 file
MediaInformation
MediaProfile
MediaFormat
UUID
. . . .



ANY FORMAT YOU WANT

The UUID Box Format: Storing Data in the UUID Box

The XML box is equipped by a mechanism to refer to the UUID box that contains the data, as described above. A format needs to be specified for the UUID box in order to organize the data within and associate the data with different regions and different media types. This format will be vendor specific and identified by the UUID.

The following format for the UUID box is one possible example. It assumes that all the embedded data is stored in one single UUID box, provided that the data are within the same file. Data associated with different regions are identified according to their corresponding region ID. Types of data are also specified.

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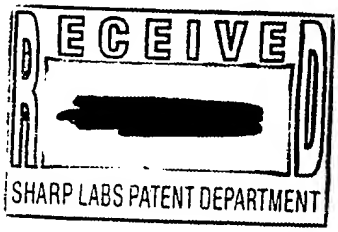
The Region Data Length is included to minimize parsing during navigation amongst different regions as the user interacts with the image.

The Media Data Length is included to enable rapid navigation of data embedded within the same region.

The following table includes the elements of the UUID box (in particular, the data part of the UUID box) ordered in a sequential manner. The first entry is the ID of the UUID box. The rest belongs to the data portion of the UUID box.

UUID Box Format	*Comments*
ID	The ID of the particular UUID box is specified by the MediaInformation/MediaFormat description referenced in the RelatedMaterial description in the XML box
Region ID	Matches the ID of the Still Region (Hot Spot) described by the StillRegion description in the XML box
Region Data Length	Total length of data associated with this region
Media Type	Media Type corresponds to the value of the `MediaType` descriptor in the RelatedMaterial description in the XML box (it may be mapped to a binary code in the UUID box)
Media Data Length	
Media Data	
. . .	
Media Type	
Media Data Length	
Media Data	
. . .	
Region ID	
Region Data Length	
Media Type	
Media Data Length	
Media Data	
. . .	

" Peter's Format "



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It should be noted that the Region ID in the above table may be generalized to an "Object ID". The Object ID may then refer to any XML object, i.e., any description that is identified by an ID. In that case, using the invention, a Person Description may have an audio annotation associated with it, or a Summary Description may have executable software associated with it. MPEG-7 supports identification of XML descriptions using unique identifiers.

Summary of the Use of MPEG-7 Tools in Connection with the JPEG2000 File Format Structures in the Alternative Embodiment

Embedded Information	*MPEG-7 Tool*	*JPEG2000 FF Structure*
Hot Spots (bounding box, ID of boxes)	Still Region DS	XML Box
Textual Annotation	Annotation DS	XML Box
URL Link	Related Material DS	XML Box
Audio/Voice Annotation Data	Related Material DS	XML Box: indicates Media Type as "Audio" and contains reference to the UUID Box; UUID Box: contains the audio data.
Executable Code	Related Material DS	XML Box: indicates Media Type as "executable" and contains reference to the ID of the UUID box containing the executable); UUID Box: contains the executable

A two-Level Implementation

A smart server may first serve the client the image data, the hot spot locations, and the type and format of the data associated with the hot spots. The data that is of interest to the user may be delivered subsequently upon user's request at the second level.

12. List related publications, patents, articles, or other references and give a brief summary (Indicate the extent of your search, attach search pages, if any):

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The following prior art has been referenced in the main body of the disclosure.

1. ISO/IEC JTC 1/SC 29/WG1 N1646: JPEG 2000 Part I Final Committee Draft Version 1.0, March 2000.
2. MPEG-7 Multimedia Description Schemes, Experimentation Model (XM) V 3.0, N3410, Geneva, May 2000.
3. MPEG-7 Multimedia Description Schemes, Working Draft (WD) V 3.0, N3411, Geneva, May 2000.

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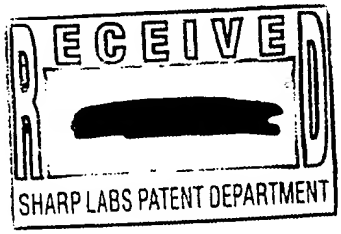
4. MPEG-7 Description Definition language (DDL) WD 3.0, N3391, Geneva, May 2000.
5. MPEG-7 Visual Part of XM 6.0, N3398, Geneva, May 2000.
6. MPEG-7 Visual Part, Working Draft (WD) V 3.0, N3399, Geneva, May 2000.
7. US6070167: Hierarchical method and system for object based audiovisual descriptive tagging of images for information retrieval, editing and manipulation.
8. SLA107: Image file format for embedding object based information to images
9. SLA141: Information management system
10. SLA237: Method for specifying preferences and usage history of audiovisual information users
11. SLA238: Method for specifying summaries of audiovisual content
12. SLA251: Method for specifying user descriptions allowing the specification and identification of multiple user preferences and history for different usage conditions
13. SLA317: Information Management System.



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